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A REVIEW OF THE SPECIES PAVO CALIFORNICUS

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INTRODUCTION

At the close of the first excavation of the University of California at Rancho La Brea, there were found among the avian remains resulting from this work a small number of very imperfect specimens representing a large gallinaceous bird of unknown affinities. Later in the same locality, the perfect tarsometatarsus of an adult male of presumably the same species was taken by the present writer and a second specimen of the same bone was generously donated by Mr. E. J. Fischer of Los Angeles. These perfect specimens constituted the material from which was described the new species *Pavo californicus* Miller[1] and the type specimen was deposited in the palaeontological collections at the University of California.

At the time the original description was published, *Meleagris gallopavo* (domestic) was the only meleagrine available for comparison. Recourse was had to the extensive monograph of Milne-

[1] Miller, L. H., Univ. Calif. Publ. Bull. Dept. Geol., vol. 5, no. 19, p. 285, 1909.

Edwards[2] in which he figures and compares *Meleagris, Pavo,* and other phasianids. Also some measurements were made upon the shank of a live male *Pavo cristatus.* With the material at hand it seemed proper to refer the fossil species to the genus *Pavo* despite the somewhat startling nature of such announcement.

After the lapse of some time the University had opportunity to make further and much more extended exploration of the asphalt beds, which resulted in the assembling of a representative series of *Pavo* remains, including most of the characteristic bones and a goodly series of the type segment, the tarsometatarsus. Related Recent species are also more perfectly represented. There are at hand complete skeletons of *Pavo cristatus* in native phase, *Meleagris ocellatus,* both sexes, and most of the skeleton of *Meleagris gallopavo* in native phase.[3] An opportunity to examine a large series of skeletons of the Recent *Meleagris gallopavo* in native phase at Yale University was afforded the writer by Professors Schuchert and Lull of that institution. In the presence of this additional material both Recent and fossil it seems proper to review the entire question of the relationships of the extinct species from Rancho La Brea, described in 1909 as *Pavo californicus.*

DETAILED COMPARISON

Tarsometatarsus.—A splendid series of twenty-five complete tarsometatarsi now represent *Pavo californicus* in the collections of the University of California. In considering this series of the type segment, there is noticeable a marked degree of variation in the total length and in the actual elevation of the spur core; the relative elevation of the spur, however, shows but little variation, remaining between forty and forty-one per cent of the total tarsal length. The age of the individual is judged from the length and the strength of the spur core and from the degree of ossification of the plantar tendons. With these criteria as a basis of age determination, it is seen that the length of tarsus is not directly proportional to age. The longest tarsometatarsus has the weakest spur and the strongest spur is found on the shortest adult bone.

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[2] Milne-Edwards, A., Oiseaux fossiles de la France, Paris, 1867–77.

[3] For the valuable *Meleagris* material grateful acknowledgment is made to Dr. L. A. Test of Missouri State School of Mines and to the National Museum of Mexico.

The stoutness of the shaft is remarkably constant for a praecocial bird of the size of *Pavo*. The extremes of transverse diameter in birds old enough to bear the spur are only 0.7 mm. apart.

One of the characters by which *Pavo* is set off from *Meleagris* is the presence of an incipient third ridge between the inner and the outer ridges of the hypotarsus. This ridge is almost entirely wanting even in old specimens of *Meleagris gallopavo* but is present in *Pavo californicus* before the ossification of the plantar tendons, and is equally marked in both sexes. This incipient ridge is but faintly indicated in *M. ocellatus* in both sexes, although both specimens at hand are fully adult. With respect to this character, the four species under consideration fall into the following progressive series: *M. gallopavo, M. ocellatus, P. cristatus,* and *P. californicus*. The outer ridge of the hypotarsus is short and is dropped downward in *Meleagris*, is longer and less prominent in *Pavo cristatus,* is longest and most prominent in *P. californicus*. In the development of the spur and in the shape of the spur core, *P. californicus* resembles *Meleagris ocellatus* more than it does *Pavo cristatus*. In the elevation of the toes, the fossil form is more like *M. ocellatus* than like *P. cristatus*. In elevation of the spur it is almost identical with *P. cristatus* and far removed from *M. ocellatus*.

From the study of this bone only, the fossil species would seem as far removed from either living species as the two living species are from each other.

In the original description of *Pavo californicus,* the statement was made that the sexes were alike except for the presence or absence of the spur core. This statement was based upon the erroneous conclusion that the fossil species followed *Meleagris gallopavo* in developing the spur as early as the ossification of the plantar tendons. A young male specimen with the plantar ridge present but with the spur lacking was identified as an adult female. With the present series before one the error of this conclusion is easily noted.

Tibiotarsus.—It will be seen from the above study of the tarsometatarsus in the Recent *Pavo* and the ocellated turkey that, while the bones in the two species are almost identical in length, the shaft of the bone is appreciably heavier in *Pavo*. The exact reverse is found to be true in comparing the tibiotarsi of the same two individuals. The total length of this segment in the peacock is 197.7 mm., in the ocellated turkey it is 187. The transverse diameter of the shaft is 8.5 mm. in the former and 9 mm. in the latter.

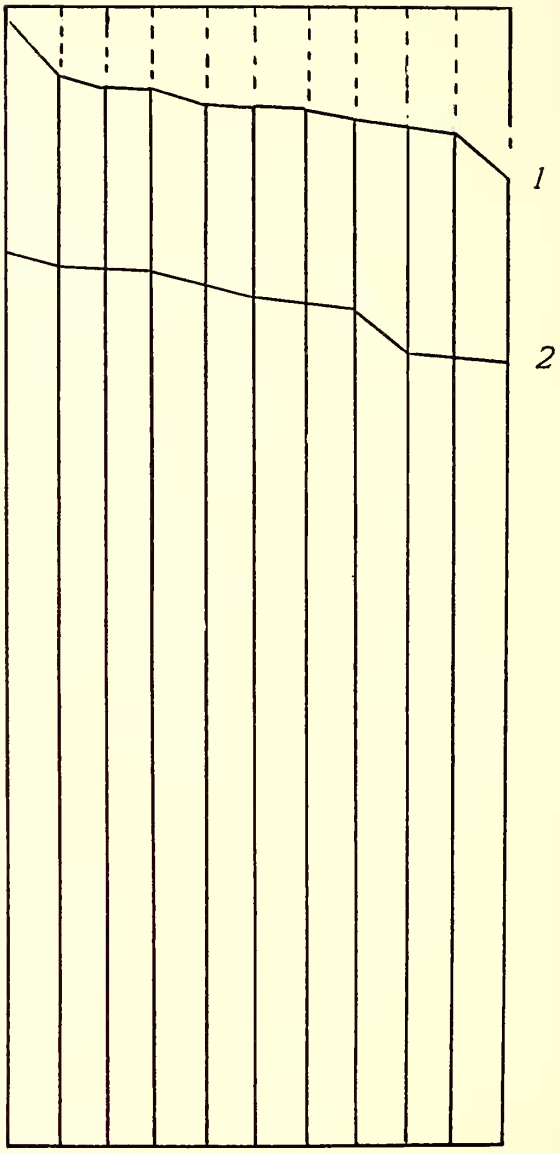

Fig. 1. *Parapavo californicus.* Tarsometatarsus. 1, Graph showing total length in a series of males, natural size; 2, the same for a series of females. Heavy vertical lines represent actual lengths of specimens.

Viewed from in front these bones show the enemial crest in *M. ocellatus* more abruptly thrust over toward the outside and the distal condyles less widely separated, although the tunnel under the osseous bridge is larger. In all these respects, the affinities of the fossil species are with *Pavo* rather than with *Melcagris*. Beyond these points there

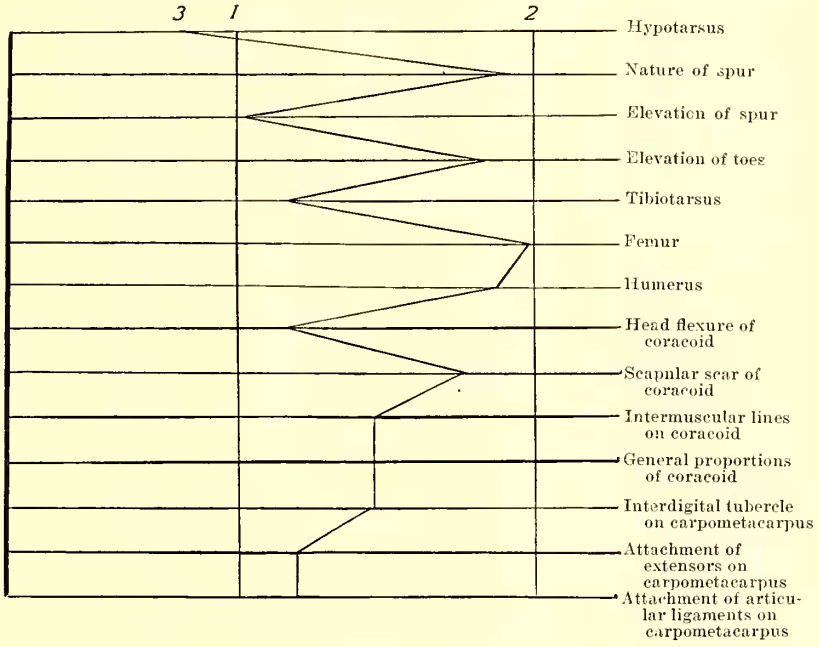

Fig. 2. Curve suggesting the relation of *Parapavo* (3) to the living *Pavo* (1) and *Agriocharis* (2). e.g., In the character of its hypotarsus, *Parapavo* is more remote from *Agriocharis* than is *Pavo*, in the nature of the spur, it is intermediate but approaches closely to *Agriocharis*, in elevation of the spur it is again intermediate but closely approximates *Pavo*, etc. Values approximated only.

are no differences between the birds as known by the tibiotarsus. Adult specimens of both sexes yield the following measurements:

TABLE OF MEASUREMENTS OF THE TIBIOTARSUS

	P. cristatus	M. ocellatus		P. californicus	
	Male	Male	Female	Male	Female
Total length	197.7 mm.	187.	170.	205.	172.
Least transverse diameter shaft	8.5	9.	9.7	11.5	8.
Transverse diameter through head	10.4	19.3	19.3	23.	18.
Transvere diameter through foot	18.	17.	17.5	20.	16.8

Femur.—Several points of difference are to be noted on comparing the femur in the living peacock and the ocellated turkey. Proportions are again reversed and *Pavo* is found to be the stouter. The stoutness may however be due to a greater degree of pneumaticity. Several

pneumatic foramina appear upon the anterior face of the trochanter and the whole bone shows a degree of translucence not visible in *Meleagris*. The disposal of the intermuscular lines on both anterior and posterior faces of the femur produces different patterns in the two species, although the difference is hard to define. In its lack of pneumatic foramina and in the pattern of its intermuscular lines the fossil species resembles *M. ocellatus* more than it does *P. cristatus*.

Humerus.—A proper comparison of the humerus in the Recent *Pavo* and *Meleagris* is hardly possible, owing to the fact that this bone in the only available specimen of peacock is either immature or pathological. The posterior limb bears every stamp of complete maturity but the humerus shows the rough, striated surface, the poorly calcified articulations, and the indistinct foramina and muscle scars of a juvenal bird. The only basis of comparison remaining is the general outline, which may not be normal and probably is decidedly abnormal. The indications are that *Pavo* has a longer, straighter, and somewhat weaker humerus than *Meleagris* has. The humerus of *Pavo californicus* is decidedly more like that of *Meleagris* than like the one specimen of *Pavo cristatus* when the adult bone is considered. When, however, a juvenal specimen of the extinct species is taken for comparison, the resemblance lies decidedly with *Pavo*.

Coracoid.—This bone in *Pavo cristatus* is shorter than in the female *Meleagris ocellatus*. The head of the bone is less abruptly bent over, the articulation of the scapula is less perfectly defined, and the intermuscular lines less pronounced. How much of this difference is due to slow maturing of the pectoral arch and limbs it is impossible to state. The only available coracoid of *P. californicus* which is in perfect condition shows a position intermediate with respect to the two Recent species under discussion. The bone as a whole is much larger than in the female *Meleagris,* the scapular scar is like *Meleagris,* the flexure of the head is like *Pavo,* the intermuscular lines show a pattern intermediate between the two.

Carpometacarpus.—In *Pavo cristatus* this composite bone is long and relatively slender as compared with *Meleagris ocellatus*. The osseous tubercle which passes from the fused digits 2 and 3 toward the ulnar side of the metacarpus is less developed and is placed nearer the proximal extremity of the interdigital space. The process to which the tendon of the extensor metacarpi radialis longior is attached is longer but more slender. The attachments of the articular ligaments also differ in detail of pattern.

In general proportions of the carpometacarpus, and in the nature and position of the interdigital tubercle, the fossil species occupies an intermediate position. In other respects this segment shows its closest affinities to lie with *Pavo*.

CONCLUSIONS

It will be seen from this careful scrutiny of all the available material, both Recent and fossil, that the original conclusion referring the Rancho La Brea species to the genus *Pavo* was not without justification. Removal of the species from the genus *Pavo* and its reference to the genus *Meleagris* would be an arbitrary step prompted simply by the fact that *Pavo* is at present foreign to the Americas. Is this a sufficient reason for such step?

If Marsh[4] be correct in his determination of *Meleagris antiquus*, the genus *Meleagris* is one of long standing in the Americas. This Oligocene species is based on the distal end of the humerus of a "large gallinaceous bird approaching in size the wild turkey and probably of the same group." It was contemporaneous with *Oreodon* in certain lake deposits of Oligocene age east of the Rockies. The specimen was said to agree in the main with *Meleagris gallopavo,* but to lack the broad longitudinal ridge on the inner surface of the distal end opposite the radial condyle, also to lack the abrupt termination of the ulnar condyle at its outer superior border. The specimen was not figured and there is nothing in the brief description which will place the species in *Meleagris* rather than in *Pavo*. The only other meleagrines known from America are *M. celer* Marsh and *M. superba* Cope from the Pleistocene of New Jersey. There is no apparent reason for considering the differentiation of *Pavo* from *Meleagris* as running back to Oligocene time nor for denying the presence of *Pavo* in the New World up until Recent time. Still less is there reason for ignoring the possible intermigration of Old and New World phasianids. The distinction by ornithologists between *Pavo* and *Meleagris* is based largely upon external characters.

Osteologically *Meleagris ocellatus* is almost as near to *Pavo* as it is to *Meleagris gallopavo*. Various authors have commented on the impropriety of using a common generic name for the two American turkeys, Chapman stating his attitude as follows:[5] "The differences

[4] Marsh, O. C., Am. Journ. Sci., vol. 2, Aug., 1871.

[5] Chapman, F. M., Bull. Am. Mus. Nat. Hist., vol. 8, art. 18, pp. 271–290, 1896.

in the form and the distribution of the warty excrescences of the head and neck, and in the character of the erectile appendages of the forehead, the more highly graduated tail and more rounded retrices, the absence of beard in the male and presence of rudimentary spurs in the female are all characters which entitle *ocelletus* to generic distinction, and I would suggest, therefore, that it be placed in a new genus for which I propose the name *Agriocharis.*"[6]

The superficial characters of the ocellated turkey are such as to give it the local Spanish name of "Pavo de Yucatan." The ocellated feathers in certain portions of the tail constitute a character comparable to, though not identical with the similar appearance in *Pavo*—a character which is hard to attribute to convergent evolution. This superficial resemblance, combining with those seen in the skeletons, indicates a close relationship between the New and the Old world phasianids. The fossil species from the asphalt is, in the combination of its osteological characters, intermediate between the Yucatan and the oriental birds, which are separated at present by subfamily distinction. It would seem imperative therefore to establish generic distinction for the Pleistocene bird. For this genus the name *Parapavo* is proposed. In a study of the phylogeny of the Phasianidae, a most logical place to search for intermediates between phasianines and meleagrines would be the Pacific Coast of North America. This search has been rewarded, and furthermore Chapman's conclusion that the of a former much wider range finds support in the occurrence at Rancho La Brea of its Pleistocene relative, *Parapavo californicus.*

[6] The writer is indebted to Dr. C. W. Richmond for a note on the priority of *Agriocharis* over *Eumeleagris,* a name proposed by Dr. Coues.

Transmitted August 15, 1915.